

BOOK REVIEWS

HAWKINS, B. A. 1994. Pattern and Process in Host-Parasitoid Interactions. Cambridge Univ. Press, Cambridge. x + 190 p. ISBN 0-521-46029-8. Hardback. \$42.95.

In 1984, when I was at the University of the West Indies, Trinidad, it was intriguing to find that the headquarters of the Commonwealth Institute of Biological Control was situated only a mile or two away. CIBC had long been involved in biological control programs around the world, introducing predators and parasites against pest insects. Two large catalogues produced by CIBC, the Herting Catalogue and the Thompson Catalogue, had been developed to assist biological control workers. The catalogues had extensive listings of host insects and their recorded parasites. I felt sure that there was a useful publication in these catalogues somewhere, and I summarized the data to see whether major insect orders, such as Lepidoptera, Diptera, Coleoptera and Hymenoptera, differed in the number of parasite species attacking them. I remember that larval Lepidoptera had many more recorded parasitoids than other orders. Unfortunately, my manuscript was rejected.

In 1987, I was pleased to see a paper by Brad Hawkins and John Lawton entitled "Species richness for parasitoids of British phytophagous insects," which used the **primary** literature to assess numbers of species of parasitoids associated with various types of insect hosts. An analogy can be found in the work of Southwood, Strong, Lawton and others who have analyzed the difference in the numbers of insect species associated with various plant species. In this earlier work, area proved to have a large effect: more widespread plants accrued greater numbers of insect species. Other factors, such as plant architecture—trees versus bushes versus grasses—also had an effect. Hawkins' new book essentially takes this concept to the next trophic level. If more-widespread plants have more species of insects, what controls the number of species of parasites on those insects? Unfortunately, as Hawkins points out, a similar analysis using the area of distribution of insects and number of parasites they support is not yet possible. No comparable atlases which detail the distribution patterns of insect species currently exist. Instead, Hawkins investigates the affects of seven "general types of independent variables," host feeding niche, host taxon, host generic diversity, sample size, climate, host food plant type and habitat type on parasitoid richness. The effects of these variables are determined on eight dependent variables: primary parasitoid species richness; parasitoid species richness by taxon, by biology (idiobiont/koinobiont), and by host stage attacked; parasitoid relative abundance; hyperparasitoid species richness; parasitism rate (the maximum total apparent parasitism rate reported for any single host population and for generation); and biological control success rate (the proportion of parasitoid introductions which have resulted in some level of pest control). Obviously there are problems in scoring some of these variables—when is biological control a success; how does one accurately assess parasitism rate when so many workers have documented variation in parasitism rates with density—but Hawkins does an admirable job of discussing most of these problems "up front."

What does Hawkins conclude? There are so many patterns and so many explanations that a listing of them here would be too extensive. However, one of Hawkins' main conclusions is that many observed patterns are consistent with a "susceptibility hypothesis"—host refuges from parasitism form the mechanistic basis for main relationships observed. Bottom-up effects are important—the biological attributes of plants and insects affect the size and species composition of parasitoid communities.

Within these broad generalizations readers will find many details to stimulate further thought.

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